Auro Headphone Plug-in User Guide

Plug-in Version 1.09

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1. Introduction

1.1 Auro 3D

Welcome to Auro-3D®, the next step in sound evolution brought to you by Auro Technologies. Audio reproduction has evolved from a point source or mono, to a single dimension or stereo, to two-dimensional surround sound, i.e. 5.1 or 7.1. To produce true three-dimensional sound, a reproduction system must include a vertical Z axis (top-to-bottom), in addition to the existing X (side-to-side) and Y (front-to-back) planar axes found in current systems. Auro-3D's three-layered approach, namely the Lower, Height and Top layers, completes this evolution by creating a realistic three-dimensional soundscape.

1.1.1 Auro 3D Formats

The Auro-3D 9.1–11.1 formats are based on, and compatible with the 5.1 Standard. They include the following additional channels:

- Auro 9.1: 5.1 + four Height channels, one above each side channel.

- Auro 10.1: 9.1 + Top channel, aka Voice of God.

- Auro 11.1: 10.1 + Height Center

The Auro-3D 11.1b and 13.1 formats are based on, and compatible with the 7.1 Standard. They include the following additional channels:

- Auro 11.1(7+4): 7.1 + four Height channels: 2 above the front speakers, Height Front Left and Height Front Right channels. And 2 above the side surround speakers, Height Back Left and Height Back Right channels.

- Auro 13.1: 11.1b + Height Center channel + Top channel

Auro Technologies developed a plug-in for Audiokinetic Wwise to allow three-dimensional sound reproduction in the context of a game.

1.2 Auro Headphone Plug-in

The Auro Headphone Plug-in presents the user with a binaural simulation of a multi-channel speaker setup in a virtual room. The dimensions and the reverberation characteristics of that virtual room can be configured by the sound designer. The Auro Headphone Plug-in visualizes speaker sources associated with each input channel, placed inside a virtual room, rendered over a pair of headphones.

The Auro Headphone Plug-in is inserted on an Audio Bus in the Master-Mixer Hierarchy to create a binaural signal from multi-channel input. The plug-in configures itself according to the host bus Channel Configuration.

Note that the Auro Panner Plug-in is no longer included because the Wwise default panner will handle all of the same functions, effectively rendering the plug-in a redundant tool within Wwise. We recommend using the Auro Headphones plug-in and the Wwise default panner as the best Spatial Audio chain.

When the Auro Headphone Plug-in is active, it will output the generated binaural audio signal on the Left and Right channels, and it will mute all remaining output channels.

2. Quickstart guide

This section presents steps to get a basic Wwise project up and running with the Auro Headphone plug-in.

- Create a new project (adding the Auro Headphone presets)

- Add a child Audio Bus to the Master Audio Bus, and give it a name. See Figure 2.1.

- Select an Auro channel configuration in the General Settings tab of your new Audio Bus. See Figure 2.2.

- Insert the Auro Mixer plug-in in the Mixer tab of your new Audio Bus. See Figure 2.3. If the Mixer tab is not enabled, enable it as depicted in Figure 2.2.

- Insert the Auro Headphone Plug-in in the Effects tab of your new Audio Bus. See Figure 2.4.

- Route a Sound Object to the newly created Audio Bus. See Figure 2.5.

A 3D position can now be specified for this Sound Object, which will be rendered by the Auro Headphone plug-in as intended.
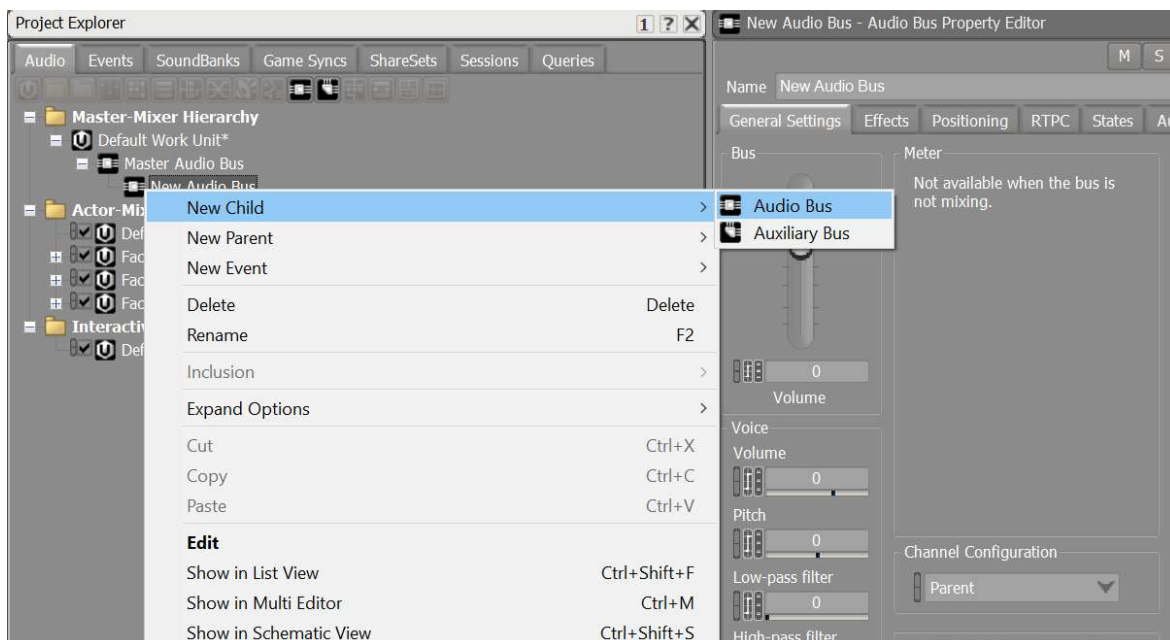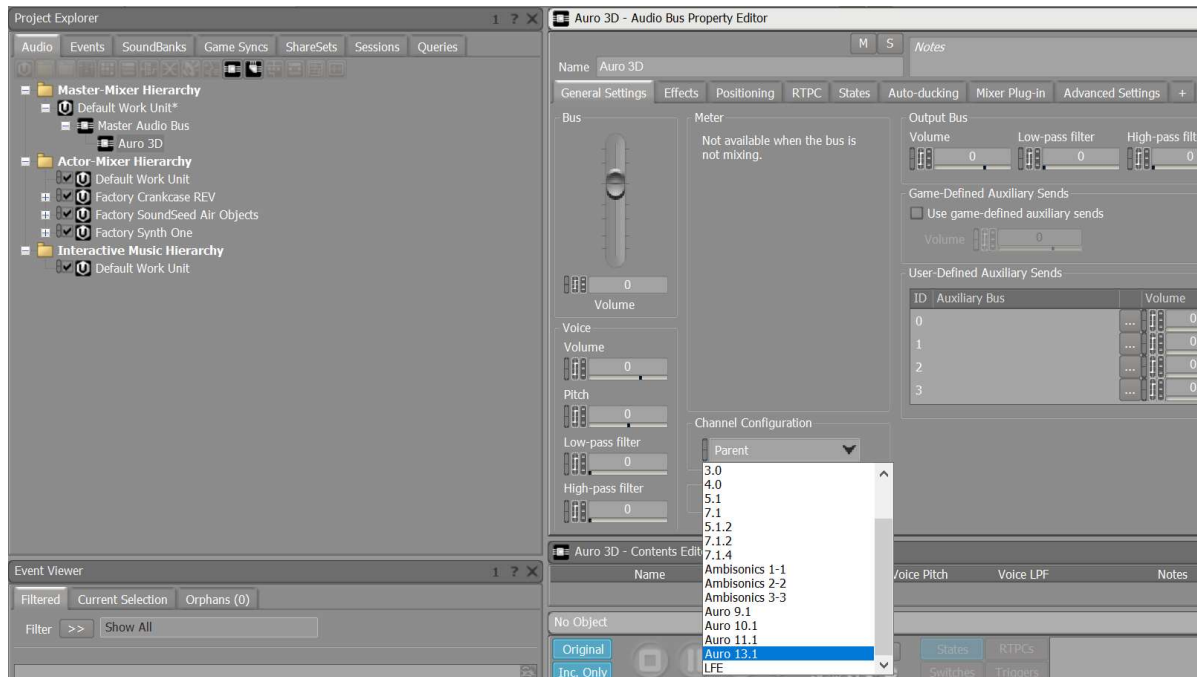

Figure 2.1: Create child Audio Bus

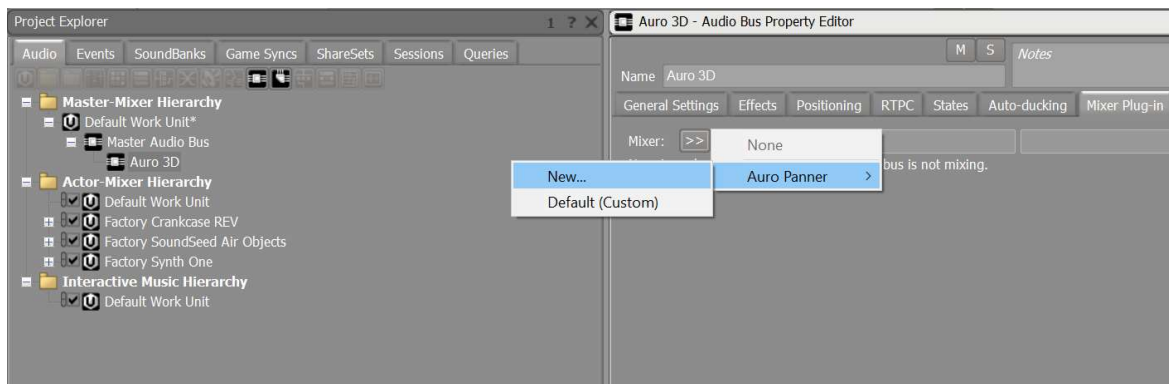*Figure 2.2: Choose desired Auro channel configuration*

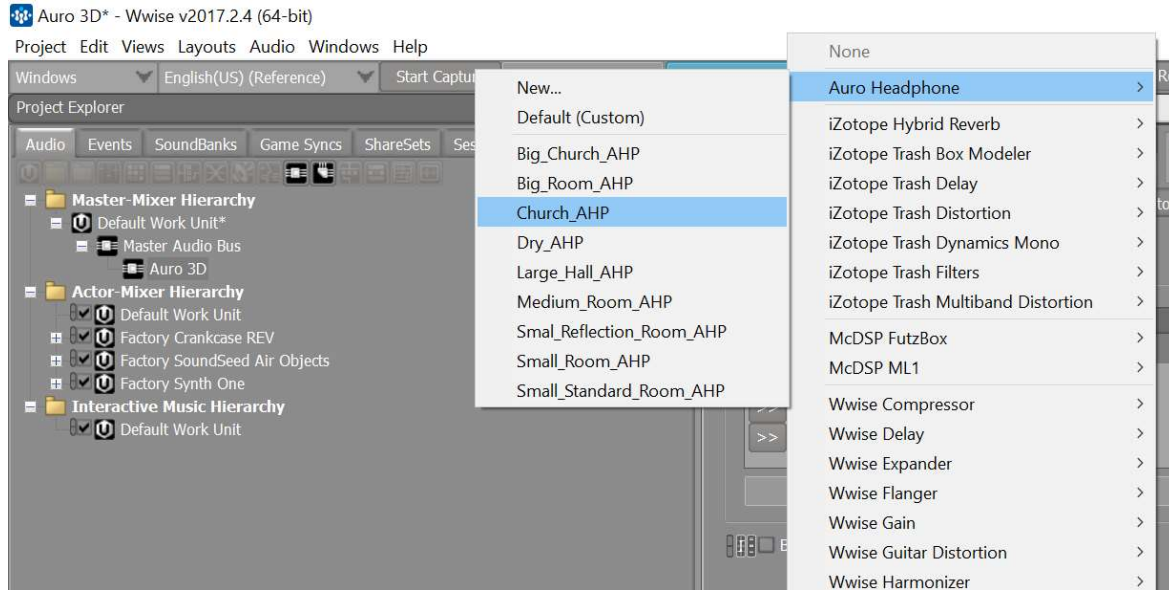*Figure 2.3: Insert Auro Mixer Plug-in on newly created Audio Bus*

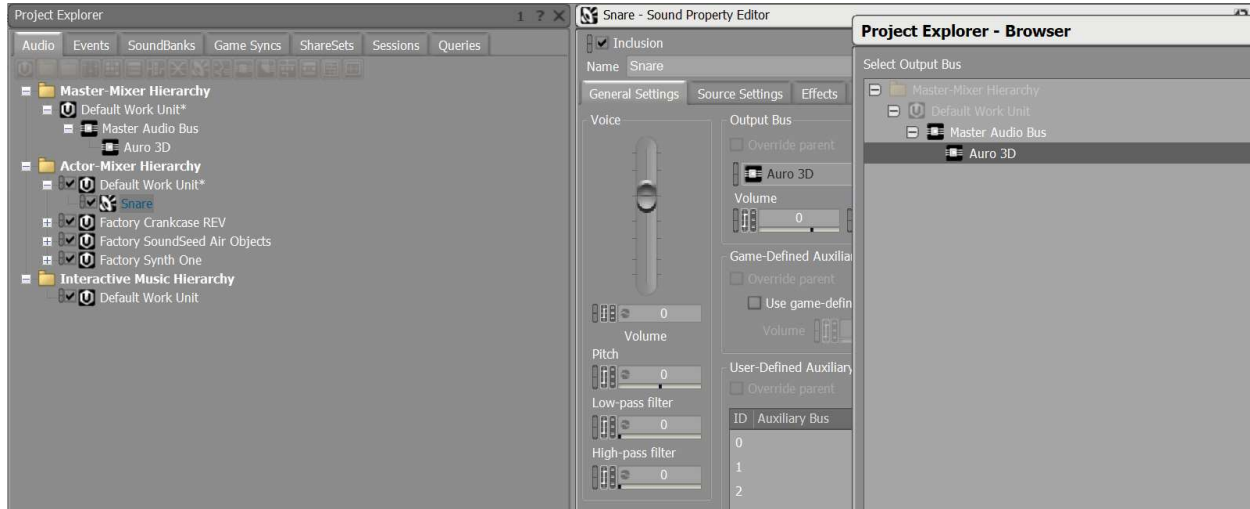*Figure 2.4: Insert Auro Headphone Plug-in in the Effects tab*

Figure 2.5: Route a Sound Object to the newly created Audio Bus

3. Auro Headphone Plug-in parameters Overview

Figure 4.1: Auro Headphone Plug-in user interface

Bypass

Bypass the effect. When Bypass is enabled, the processed stereo output will be replaced by a normal stereo downmix of the multi-channel input. The Bypass offset parameter can then be used to offset the gain of that stereo downmix. This bypass behavior differs from the default Wwise Authoring application bypass behavior. The default bypass behavior outputs multi-channel sound as defined by the channel configuration of the host bus. Note that both the Level and Bypass offset parameters affect the output level when Bypass is enabled.

Reverb

Toggle button to enable-disable room reverb. When reverb is disabled, CPU load will lower due to omitted calculations and irrelevant controls are disabled (see Figure 4.2).

Level

Output gain. Range: [-inf , 12.0 dB]

Figure 4.2: Auro Headphone Plug-in user interface with reverb disabled

ER level

Gain of early reflections. Range: [-inf , 12.0 dB]

LFE level

Gain applied to the incoming LFE channel before sending it to both ears. Range: [-inf , 12.0 dB]

Bypass offset

Applies a gain offset to the global output when the Bypass option in the Auro Headphone Plug-in user interface is enabled. Allows balancing the processed and bypassed gains, it helps with comparing renderings without energy gap. Range: [-inf , 12.0 dB]

Speaker dist.

Distance of the speaker sources, in meters. Each input channel is mapped into a virtual speaker inside the virtual room. This setting controls their distance to the listener. Range: [1.00 m, 3.00 m]

Left Right Bottom Top Front Back

Distance to the respective walls, in meters. Influences the delay-times for the early reflections. All 6 walls can be positioned relatively to the listening position. To prevent unwanted room modal response, try to use unrelated (mutually prime) and asymmetrical values for the walls distances. Range: [1.00 m, 10.00 m]

Delay factor

Sets the delay factor for the reflections, it allows delaying all early reflections by a given factor. A value of 2.00 means that all reflections are heard just like if the walls where two times farther, but with no extra attenuation. Helps for monitoring and setting the early reflections. Range: [1.00 , 4.00]

Pre delay

Sets the reverberation pre-delay value, in milliseconds. Range: [0 ms, 125 ms]

Tr 60

Sets the reverb duration, in seconds. Represents the time taken for the signal to drop by 60dB. Range: [0.00 s, 2.00 s]

Alpha

The Alpha parameter represents a measure of damping in the reverberation algorithm. It models the frequency dependent absorption when reflecting sound of a wall, and absorption due to traveling through air.

Range: [0 , 1]
Alpha = 0 - maximum damping is applied
Alpha = 1 - no damping is applied.

Damping includes the use of a low-pass filter to model absorption of sound energy, shaping the frequency content of the reverberation over time. The FCut parameter controls the cutoff frequency of this low-pass filter.

The Alpha parameter can be seen as the mix between low-pass filtered signal and the unfiltered signal.

FCut

Cutoff frequency of the low-pass filter used for damping. Also see the description of the alpha parameter. Usually set in the 2-8 kHz range. Range: [500 Hz, 20,000 Hz]

4. Additional notes

If the wall distance for a particular wall is smaller than the speaker distance, the algorithm will not generate early reflections for that particular wall.

The purpose of the plug-in is to simulate binaural hearing for a multi-channel input, thus for mono (1.0) configuration of the host bus the plug-in will be in bypass.

To prevent an unwanted room modal response (i.e. unpleasant resonances), try to use unrelated (mutually prime) and asymmetrical values for the wall distances.

Tom Todia posted an [Audiokinetic Blog](#) related to using Auro Headphone in the context of Wwise.